

Zero Retries issue 0162 2024-07-26

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its fourth year of publication, with 1900+ subscribers. Radios are computers - with antennas!

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - <https://www.zeroretires.org/p/zero-retries-0162>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My *belated* thanks to **Prefers to Remain Anonymous 21** for becoming a **New Annual Paid Subscriber** to Zero Retries on 2024-02-09. That acknowledgement should have appeared in **Zero Retries 0139**, and I apologize for that omission.

My thanks to **Prefers to Remain Anonymous 06** for being a **Renewed Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Prefers to Remain Anonymous 07** for being a **Renewed Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Prefers to Remain Anonymous 40** for **upgrading** from a free subscriber to Zero Retries to an **Annual Paid Subscriber** to Zero Retries this past week!

Financial support is a real vote of confidence for continuing to publish Zero Retries.

Major Conference Countdowns

- [JARL Ham Fair 2024](#) in Tokyo, Japan on 2024-08-24 and 25, in 4 weeks!
- [Pacificon 2024](#) in San Ramon, California, USA on 2024-10-18 thru 20 in 12 weeks. Tina KD7WSF and I plan to attend Pacificon 2024 (which makes it “major” to us). I have offered to do a presentation about Technological Innovation in Amateur Radio, and (I *think*) my proposal has been accepted.

See the **Zero Retries Guide to Zero Retries Interesting Events** for additional events.

The Writing Just Gets Away From Me Sometimes

This is yet another issue of Zero Retries where the content just got away from me, and the only external indication that I had written too much was that my butt became numb from sitting too long. There are many times over the now three years of Zero Retries where the writing is just fun, and this was one of those weeks.

You’ll notice a lot of attention given to the 902-928 MHz band in this issue. There are three reasons. The first is because it’s probably my favorite band, mostly for all the interesting “Part 15” uses it has been put to over the decades since being opened for communication use in 1985. For example, a continuously deferred writing project, that I still hope to do one day, is to write a small book about the history of Metricom, who was the first company to attempt to provide a commercial Internet service using an ISM band, preceding the rise of Wireless Internet Service Providers doing so by at least a half-decade, if not more. When Metricom attempted that, the FCC initially said, “Um no, you can’t provide a commercial *service* in an ISM band”. Metricom said “show us in your rules where it says we can’t”. Point taken, and the FCC stood down. If you’re really interested in 902-928 MHz, I recommend reading that section in the great book [Wireless Spectrum Finder](#), beginning on Page 153. (Thank you, Internet Archive, for making it available online, and author Bennett Z. Kobb AK4AV for writing a great book!).

The second is that writing about the myriad, and at times downright *whacky* uses of 902-928 MHz will be one of many recurring themes in a newsletter that I will launch sometime in Fall, 2024 that will feature my unconventional perspective on the foibles of the telecom / Internet industry. (How’s the construction of that new 5G network coming along, Dish

Networks?) Most of the stories I'll write there will relate to radio technology. I'll be telling interesting stories to a non-Amateur Radio audience that will hopefully find that newsletter interesting enough to pay a reasonable subscription fee. At a minimum, it will be an interesting experiment for a year to see if it's a viable product.

Third, 902-928 MHz is the "magic band" between UHF and Microwave with some of the best aspects of both. It's nearly as large as 420-450 MHz (26, vs 30 MHz), but still relatively easy to work with, using yagi beam antennas, reasonably-priced coaxial cable, etc. with less risk to eyeballs, etc. from microwave transmissions.

Calculated Ignorance of Amateur Radio

*Post publication update - see **Zero Retries 0165** - Followup to The LEO Satellite Industry Needs More Engineers for an update relevant to this mini-article. Turns out, Amateur Radio is a prominent part of this program.*

In **Zero Retries 0140**, I wrote an article titled Amateur Radio and the Growth of the Spectrum Workforce in the US National Spectrum Strategy (which turned out to be a short series). Basically, the US needs (and the US Government painfully recognizes this need) many more employees that understand radio technology. It was painful to see the "gyrations" that the panelists (and government agencies) have done to recruit people into training programs to create such expertise... all while completely ignoring the existence of Amateur Radio and that participating in Amateur Radio is a defacto self-education in radio technology.

In **ZR > BEACON** in this issue, I mention a similar situation about the Low Earth Orbit (LEO) satellite industry needing more employees with expertise in radio technology... but completely ignoring that Amateur Radio has been self-educating Amateur Radio Operators on radio and LEO satellite technology - *for decades!*

Originally I thought this was simple ignorance; the perception that Ham Radio was a thing from back in the 1950s with a huge antenna on a tower, with Grandpa sitting in the basement in front of a big tube radio set, tapping on a Morse Code key... *right?* That couldn't *possibly* have anything to do with modern telecommunications - cell phones, Wi-Fi, or LEO satellites... *right?*

But now I think something else is occurring - a "calculated ignorance" of the existence of Amateur Radio and the role of Amateur Radio Operators to self-educate themselves about radio technology. I remember a memorable phrase attributed to a principal of Ziff Davis magazine publishing group when Popular Electronics (which featured a lot of electronics projects that hobbyists could tackle) transitioned to "Computers and Electronics" (with few or no projects). The quote was something like "We're glad to make that change; we'd rather not be publishing magazines for the *dirty fingernails crowd*".

I don't think this "calculated ignorance" of Amateur Radio can last much longer - in government, in companies, in society. *They need the help*, (and they need it *more*, every month). Their "system" of recruitment, special programs, scholarships, industry training, isn't working, at least fast enough. The "spectrum workforce" is rapidly aging out, having drawn from the big pool of radio technology experience resulting from the two way radio industry, the early cellular industry, the military (back when they didn't depend mostly on satellites, so they cared about training radio operators), the Bell system employing lots of radio technology experts to maintain microwave networks and car telephones, even television repair. Radio equipment broke a lot back then, so you needed a *lot* of people that could keep it all working. Now, you mostly hear about computers and networking, and not much need for radio technology expertise if you follow the manufacturer's guidelines for deploying Wi-Fi access points.

In considering the replacement of the Spectrum Workforce that's aging out, it's a much shorter leap to reach into the ranks of Amateur Radio to get that expertise than starting from scratch. In saying that, I'm *not* positing that the average Amateur Radio Operator is qualified to start designing cellular towers or user terminals for Low Earth Orbit satellites on the basis of their Amateur Radio experience. (I'm sure not!) But Amateur Radio Operators understand the basics of radio technology from their hands-on experience *a lot better* than the average person who's never had any hands-on experience with radio technology. If you start with a Ham, you get a better, more capable Spectrum Workforce - like Qualcomm did when they recruited and hired Phil Karn **KA9Q**. (Read on for the relevance of that reference.)

Congrats to Tom Salzer KJ7T on 100 Issues (and 1000 Subscribers) of Random Wire Review Newsletter!

This week, KJ7T has published another [all Zero Retries Interesting issue of Random Wire Review](#) and it coincides with achieving 1000 subscribers. It's *work* and *commitment* to publish your content consistently, and keep it consistently interesting that 1000 people commit to following your work and allow your content to come into their email inbox every week.

Congrats, Tom, and I look forward to Random Wire Review every Friday morning!

73,

Steve N8GNJ

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Irrational Exuberance About Amateur Radio - Four Data Points

By Steve Stroh N8GNJ

- *Nothing great has ever been accomplished without irrational exuberance.*
Tom Evslin
- *Irrational exuberance is pretty much the business model of Zero Retries Newsletter.*
Steve Stroh N8GNJ

I used to have these two quotes on the “masthead” of Zero Retries... until Zero Retries started to get “too long” and I moved them to the About Zero Retries page to make more room for “content”.

My “irrational exuberance” about Amateur Radio has gotten me through some rough moments and low points over the three years I’ve been writing Zero Retries, such as observing too much unwarranted (in my opinion) gloom, apathy, and misogyny, and way, **Way**, **WAY** too much “Well... *that’s not **real** Amateur Radio...*” stupidity being expressed.

There is just so much cool and interesting about Amateur Radio, and even if I had started as an Amateur Radio Operator as a teen (as some have), I don’t think *two* full human lifetimes would be enough to learn all that I’m endlessly curious about within Amateur Radio. Here are ~~three~~ *four* recent stories from my perspective about why Amateur Radio (and having Amateur Radio as a part of your life) is *just cool*, and keeps me endlessly interested in always learning more.

HamWAN Lookout Node Repair

Last Saturday 2024-07-20, I spent the day on top of a local mountain - [Lookout Mountain1](#). I was one of three “ground crew” on a mission to repair two dead sectors of the “Lookout” node of the Puget Sound Data Ring (aka [HamWAN](#)).



Image courtesy of hamwan.org

Here's the detail from clicking on the "nuclear symbol" of the "Lookout" node near Bellingham, Washington:

Lookout

Three sectors, plus backhaul links to SnoDEM, and Triangle Mnt

Triangle-Lookout link

- distance: 55.8 miles
- signal strength: null dBm
- speed: 0 Mbps²

Lookout-Snodem link

- distance: 53.0 miles
- signal strength: -58 dBm
- speed: 115.5 Mbps

The red overlays indicate a general coverage to one of the sectors on Lookout on 5.9 GHz, with reasonable effort on the user's station such as getting a dish antenna elevated in the clear.

"Sectors" are 120 degree coverage on 5.9 GHz (Amateur Radio semi-exclusive) for user access. "Links" are point-to-point, narrow-beam, high performance redundant links for "backhaul". Triangle is another high profile communications site in British Columbia, Canada to the North, and "Snodem" is a communications tower at the Snohomish County (Everett) Washington Department of Emergency Management headquarters.

During the previous winter, the Lookout node experienced cable damage to two of its three sectors and it was hoped that replacing the cables would restore the two sectors for full function. Fortunately that was the case - while it wasn't simple, easy, or fast to replace the damaged cabling for the two tower climbers, it was a known process and we were able to [complete that task](#). By late afternoon, Lookout's three sectors were working, along with the two point-to-point links, restoring the full functionality of the Lookout node.

The **Puget Sound Data Ring - PSDR** (the name of the this particular network, the original / proof of concept) **HamWAN** (the overall technology / network architecture) is a remarkable achievement of a small group of dedicated Amateur Radio Operators to build a resilient, high speed microwave network that covers the heavily populated areas of Western Washington from Bellingham in the North, nearly to Vancouver Washington in the South. One of the primary points of design of each PSDR node is that if there is damage to sectors or point to point links on a node, the node incorporates all necessary services for that node to continue to function "standalone". Thus users on a single sector can continue to communicate via that sector, or multiple sectors, etc. with no dependence on centralized services such as the case (and, thus, failure prone) cellular networks, or commercial microwave networks, etc.

The existence, for years now, of PSDR has been a point of irrational exuberance to me. PSDR demonstrates that a small group of Amateur Radio Operators can create and maintain such a network, and the network owners allow its use, unrestricted, by any Amateur Radio Operator that can put in the minor work to build their own user node, and learn enough about TCP/IP networking to use it without causing disruption to the network or other users. There are a number of Amateur Radio microwave networks in the US, but most (that I've heard of) are restricted to "authorized" users, not general access. [Rocky Mountain Ham Radio's Amateur Microwave Network](#) is an example. That PSDR is "open access" is thus more remarkable. PSDR is "living proof" of the *relevance of Amateur Radio in the 2020s* - a long-distance, multi-node, high speed TCP/IP network supporting modern network services and devices such as VOIP phones, live view cameras, videoconferencing, large file transfers, etc. PSDR lives up to the ideals of Amateur Radio by offering free-to-access services and thus actively encourage Amateur Radio learning and experimentation. PSDR also makes a handy backup communications system when other communications systems fall down.

Long time readers of Zero Retries have read my regular references to the "glory days" of the [Puget Sound Amateur Radio TCP/IP Network](#), the network of 9600 bps bit-regenerating data repeaters operating in the Seattle, Washington area in the 1990s. As much as I miss the PSARTN, and hope (and evangelize) for the equivalent capabilities in the 2020s... having the pretty unique microwave, *fast*, all-TCP/IP Puget Sound Data Ring is the modern equivalent of the PSARTN.

YouTube Review of Meshtastic Units by Jeff Geerling KF0MYB

Jeff Geerling KF0MYB is a recent, and somewhat “stealthy” new Amateur Radio Operator. While he doesn’t mention Amateur Radio much on his two YouTube channels [Jeff Geerling](#) and [Geerling Engineering](#), KF0MYB is hugely influential in the Raspberry Pi and Maker community and (in my opinion) is one of the best YouTube creators.

KF0MYB and his Dad, Joe Geerling KF0MYJ got their Amateur Radio licenses at the same time, and KF0MYJ is a veteran Broadcast Engineer for a number of radio broadcast stations in the St. Louis, Missouri area, thus it’s fun to watch the two of them do a video together with KF0MYB’s younger, “hacker” perspective, and KF0MYJ’s long experience with radio technology, but being new to Amateur Radio.

I’m sure that by now, most Zero Retries readers know at least a minimal amount about [Meshtastic](#):

- It’s a decentralized, independent system with no dependencies on Internet, cellular, or satellite technology; use of GPS for location and time is optional.
- Operates on small, inexpensive devices using the robust [LoRa](#) technology, on license-exempt spectrum.
- When using license-exempt spectrum, no (Amateur Radio or other) license is required to use LoRa or Meshtastic.
- The Meshtastic software uses the LoRa radios to form a mesh network for text messaging.
- There are... *many*... variants of units suitable for using Meshtastic, from the minimal units that KF0MYB discusses (which pair to a Meshtastic app on a smartphone), to self-contained handheld terminals with keyboard and screen, to “node” units intended solely for creating relay points (effectively, digipeaters).

While KF0MYB’s video is about *Meshtastic*... it exposes his audience to independent data communications via radio, in a form that anyone who’s technical curious can learn from and experiment with. That’s effectively Amateur Radio in the 2020s, without the license. I’ve previously, and probably often quoted [Mark Herbert GILRO](#) for stating this incredibly valuable “framing” of Meshtastic as it relates to Amateur Radio:

Meshtastic is a gateway drug into Amateur Radio!

And thus this “one more” discussion of Meshtastic on YouTube (there are *many*...) is just more... *momentum*... for those that are technically curious about radio technology to learn hands-on and experiment with it. Initially with Meshtastic or perhaps [Ribbit / Rattlegram](#). The most adventurous experimenters will probably find their way to Amateur Radio and see the greater capabilities that are possible with Amateur Radio - higher power, more spectrum, full duplex repeaters, etc. That search for a better experience than Meshtastic may have already begun, as Andy Kirby M6JKA posits in his YouTube video [MESHTASTIC is broken... SO WHATS NEXT!?](#)

I hope that we - the progressive elements of Amateur Radio, including us Zero Retries Co-Conspirators of “All things digital and fun” will soon be ready for them with at least equivalent, and hopefully better systems. Perhaps a “Super Meshtastic”?

While a full exploration of what “Super Meshtastic” might be will have to be deferred for a future article, just imagine an implementation of Meshtastic that can take advantage of longer range links, ability to scale to thousands of users in the same network with dynamic channel assignment, etc. All of that is feasible with Amateur Radio’s tens of MHz of VHF / UHF spectrum (Meshtastic on 222 - 225 MHz, anyone?), being able to make use of independent microwave networks such as Puget Sound Data Ring (see above) and Amateur Radio Emergency Data Network (AREDN) networks, etc.

We can already see the outlines of Meshtastic-like capabilities in Amateur Radio with...

Devices:

- [New ComJot CJ-1](#) DMR portable radio with a current Android subsystem
- [Kenwood TH-D75A](#) portable data radio with the [Island Magic B.B. Link Adapter](#)
- [PicoAPRS \[Micro Portable\] Transceiver](#)
- [Mobilinkd TNC4](#)
- [Digirig](#) audio interface

Application Software

- [RadioMail](#) IOS app for Winlink
- [WoAD](#) Android app for Win-link
- [APRS.fi](#) IOS app for APRS
- [APRSdroid](#) Android app for APRS

Protocols / Networks

- [Winlink](#) and its Radio Mail Server architecture (can be used peer-to-peer)
- [APRS Messaging](#) - text messaging within APRS
- [D-RATS](#) - text messaging within D-Star
- [Communication and Telemetry System \(CATS\)](#) “comment whisker” (text message)
- [Digital Mobile Radio Messaging](#)
- [POCSAG on Amateur Radio](#) - using the robust alphanumeric paging standard in Amateur Radio

Best of all, Meshtastic is open source, so it is *certainly possible* for talented, motivated folks to leverage the work done with Meshtastic create a “Super Meshtastic”.

Community / Low Power FM Broadcast Radio Stations - KMRE in Bellingham, Washington

I periodically mention the Zero Retries Guide to Zero Retries Interesting Events that I maintain. A Zero Retries reader suggested that I include the Grassroots Radio Conference 2024 because it is a conference for [Community \[Broadcast\] Radio](#), which this reader considers to be Amateur Radio adjacent. The reader also mentioned that in their experience, many Amateur Radio Operators are involved in community radio stations because of their familiarity with radio technology, a chance to offering hyperlocal media coverage, and perhaps even some on-air participation. That last point isn’t entirely unknown for there to be an Amateur Radio program on broadcast radio - [Ria Jaiam N2RJ](#) hosts a program on Amateur Radio on shortwave broadcast station WRMI.

That got me curious about the Community Radio station in *my* area - [KMRE](#) on 88.3 MHz FM, with transmitter and studio both in Bellingham, Washington. I recently met with several senior members of KMRE and I was impressed with [all that they have accomplished with KMRE in the last few years](#), including a major fundraising campaign, receiving approval for higher transmit power (now authorized for 2000 watts), relocation of their transmitter to a better location with a higher antenna, and relocation of their studio to a local community college. It’s impressive that all management and on-air programming is done solely by volunteers.

The meeting I had with the KMRE members was preliminary, but they were interested in my technical / Amateur Radio background. I asked questions relating to their broadcast systems that few people had ever asked, and I mentioned a few perspectives that they had not considered, such as trying to work more closely with various emergency planning agencies³ in the area because they have some unique attributes:

- A mission to serve the Bellingham and Whatcom County community,
- A not-for-profit entity,
- Facilities and management fully within the local area,
- Their structure could allow for pre-emption of their local programming to broadcast continuous updates during an emergency.

I also discussed KMRE's issues with marginal coverage over part of its service area, discussing topology, antenna placement on the tower, potential use of translators, etc. We also talked about their current reliance on a national broadband Internet provider between their studio and their transmitter, which leaped out at me as a single point of (likely) failure in an emergency.

In general, they seemed surprised that I knew a lot about broadcast radio technology despite never having been involved with broadcasting. I explained that at its most fundamental level, the technologies of broadcast radio, Amateur Radio, two-way commercial / public safety radio, cellular, and even satellite communications is pretty universal, so my experience with Amateur Radio prepared me pretty well to understand KMRE's radio broadcast technology. I think they gained some respect for Amateur Radio during our discussions.

We briefly discussed some ideas I had for additional programming on KMRE. My involvement in a local program might be a win / win. KMRE has a good studio setup with high quality audio and recording equipment, and I had several ideas for a unique program that doesn't overlap with any of their current programming, nor would compete with any other local broadcast station.

The overlap between Amateur Radio and Community [Broadcast] Radio is interesting and could be a lot of fun. KMRE and I still have more discussions to complete, and I look forward to seeing their studio and transmitter... which was yet another surprise to them - no one has asked to go see the *transmitter* before).

Thus, I can recommend reaching out to your local Community Radio station if you have some spare time to volunteer. It might be that you have capabilities from your Amateur Radio background that could help them, and you could have a lot of fun getting involved.

New Meme - Hackers Are The Future of Ham Radio

On 2024-07-15, Dan Romanchik KB6NU wrote a blog article titled [Back to the future: Are hackers the future of amateur radio?](#)

Just a few days later, KB6NU's article was [mentioned on Hackaday](#), and from that mention, the topic seemed to go mildly viral. I've seen numerous references to a new meme that seems to be developing - **Hackers Are The Future of Ham Radio**. KB6NU asked a *question*, but the meme seems to be a *statement*.

I think that's because in reading KB6NU's article about his experience at the HOPE 2024 conference, and seeing his excellent slide deck, techies can't help but see the obvious areas of interest and overlap between their technical backgrounds (and yes, "hacking"), and the possibilities inherent in Amateur Radio. This isn't the first time for interaction between an event within a technical community (that isn't Amateur Radio) and presenting Amateur Radio in a "techie relevant context". In Zero Retries 0000, I mentioned this interesting experience reported from DEFCON 2014:

Another encouraging sign is despite Amateur Radio's (seemingly) best efforts to market Amateur Radio's potential for self-education in wireless technology ("sushi") as old white guys sitting in their basement tapping on a Morse Code key ("cold, dead, fish"), we have moments like this:

It's instructive that the largest Volunteer Examiner (VE) Amateur Radio license testing session was at [DEFCON 22 in August 2014](#) (see pages 8 and 9). 205 hackers took their Amateur Radio test at DEFCON 22; the number that passed wasn't noted in the article.

There is also the very popular [GNU Radio Conference -GRCon](#) (which is the primary (non-government) event for Software Defined Radio technology. [Amateur Radio License Exams](#) are prominently listed on the sidebar of the 2024 conference, immediately under the Scheule link. Although I don't (currently) see any Amateur Radio specific talks scheduled, I suspect it

would be hard to attend GRCon 2024 and not encounter Amateur Radio at some point.

Lastly, [Ham Radio Village](#) was (as it was explained to me) originally the Amateur Radio “village” (Special Interest Group) at the annual DEFCON conferences. Ham Radio Village became so successful that it (see the mention above) that it organized itself as a standalone (US) 501(c)(3) not-for-profit organization so that it could extend its mission to conferences other than DEFCON:

Strengthening the Amateur Radio community through fun events!

Our mission is to deliver high-quality and innovate amateur radio related educational content, hands-on experiences, and license testing sessions online and in-person through events. We believe that the more people know about amateur radio, the more safe, secure, functional, and innovative our wireless products, services, and experiments will be.

Conclusion

The combination of all of these recent “irrational exuberance” influences - Puget Sound Data Ring / HamWAN, Meshtastic, Community / Low Power FM Broadcast, and Hackers Are The Future of Amateur Radio all combine in my mind to inform the hopeful and progressive tone of Zero Retries. Generally, *there's a lot of interesting stuff going on* in Amateur Radio (and adjacent to Amateur Radio).

While these sorts of things keep *me* going, it's unfortunate for new Amateur Radio Operators that to know about such interesting stuff, you have to be involved with it or *know where to look for the good info*⁴. It's no longer the case that “general interest” Amateur Radio media can “bring it to you”. *They* just don't seem to be able to do that in this era, especially coverage of topics on the bleeding edges of technology like (true, not marketing-speak) Software Defined Radio technology⁵. I'm realistic that while Zero Retries can help expose the interesting stuff, Zero Retries is (currently) a long form text publication in what is now a short video / short audio / short text world, with 2000 or so readers, hardly any budget, and a staff of 0.5. I hope that Amateur Radio can do a better job of evangelizing these amazing new capabilities occurring within Amateur Radio, *and soon*. We need to let the techies / hackers know about Amateur Radio so they can join in on all the fun.

New Distance Record Claimed for 802.11ah (Wi-Fi HaLow) on 902-928 MHz (33 cm) Band

By Steve Stroh N8GNJ

The 902-928 MHz (33 cm) band in North America is an underutilized resource in Amateur Radio, especially for data communications. Some recent developments may make 902-928 MHz much more usable for Amateur Radio data communications.

In this article, I'm not referencing the use of voice radios (such commercial / public safety radios re-tuned from 800 MHz to 902-928 MHz).

902-928 MHz (33 cm) Band Primer

There are several issues that have stymied the widespread use of the 902-928 MHz (33 cm) band for data communications in Amateur Radio:

- [902-928 MHz](#) is an [Industrial, Scientific, and Medical \(ISM\)](#) “US Part 15” license-exempt band that is only allocated in North America and a few other countries. It is not a worldwide allocation. The Amateur Radio allocation of 902-928 MHz is a 100% overlay of the same band, with Amateur Radio having some additional privileges beyond license-exempt such as the ability to use higher power transmissions.
- There are overlapping use cases for 902-928 MHz beyond license-exempt and Amateur Radio, such as a [proposed terrestrial navigation system](#) and [various US Government use such as US Navy RADAR](#). One early wireless local area network system that used 902-928 MHz was [NCR WaveLAN](#) (which at least a few folks connected external antennas to). For a time, 902-928 MHz was used intensively in a few US cities by the now-defunct [Metricom Ricochet6](#) Internet Access network.
- 902-928 MHz is now the primary band used for various Internet of Things systems and networks such as Automatic Meter Reading (AMR), stream flow monitoring, and other low-data-rate activities that are mostly “transmit-only”. Thus there is a large amount of “activity” in 902-928 MHz. Note that “activity” is not the same as “interference” as

“Part 15.247” regulations require that
Unlicensed devices must accept any interference received, including interference that may cause undesired operation.

- Lack of standardization between manufacturers and products (proprietary products / standards), meant that...
- Prices of 902-928 MHz products remained high (captive markets), compared to products available for 2.4 GHz and 5-6 GHz,
- Relatively few products available as the Wireless ISP industry largely abandoned 902-928 MHz because demand for high Internet speeds could not be accommodated in a “noisy” band with only 26 MHz of spectrum.

That said, there are many proprietary data radios available for 902-928 MHz band such as [Doodle Labs Mesh Rider](#) and [FreeWave Technologies FGR3 Series](#).

902-928 MHz is now seeing a resurgence in use by (license-exempt) experimenters because of the rise of [Meshtastic](#) which is based on [LoRa](#) radios operating in license-exempt spectrum. In the US, LoRa radios primarily operate on 902-928 MHz. LoRa devices have become so ubiquitous that LoRa has become a defacto industry standard and thus there *is* interoperability between various LoRa devices - because [all LoRa radios are manufactured by Semtech](#).

IEEE 802.11ah / Wi-Fi HaLow; the Emergence of Teledatics

In the last few years, a relatively new standard for data radios for 902-928 MHz has begun to be widely implemented - [IEEE Standard 802.11ah / Wi-Fi HaLow](#). Note that these are two different things. 802.11ah is a *standard* but from long experience, it's possible for two manufacturers to build products to the same standard... and for those two manufacturer's products not to interoperate. Thus to *insure* interoperability, the only solution was to buy *only one manufacturer's products* with the ~~assumption~~ hope that interoperability would be maintained within their product lines and periodic updates to their products.

The [Wi-Fi Alliance](#) was formed to fix that problem in the Wireless Local Area Network (WLAN) industry and has created *interoperability* standards separate from the IEEE standards. The Wi-Fi brand name and various sub-brands (such as Wi-Fi HaLow) can *only* be used on products that have passed Wi-Fi Alliance's interoperability testing and are thus *proven* to be interoperable with other manufacturer's products.

But it takes time for such standards / industry / products and a customer base to “gell” together, and we now (finally) seem to be at that point with Wi-Fi certified products that operate in 902-928 MHz - **Wi-Fi HaLow**.

[Teledatics](#) is a new company that is focused on making Wi-Fi HaLow products.

I discussed Teledatics' first product in **Zero Retries 0038** on 2022-03-18 - Halo TD-XPAH - New 902-928 MHz 802.11ah Radio. While I bought that product from its crowdsourcing campaign, I have yet to install it and test it (writing Zero Retries keeps me pretty busy).

[Per a “coming soon” page on Crowd Supply](#), Teledatics seems to be on the cusp of introducing two new product lines for 902-928 MHz - HaloMax and LoraMax.

HaloMax is a small unit that does 802.11ah on 902-928 MHz, and the article claims it is compliant with Wi-Fi HaLow. It has an external antenna connector and transmit power is 1 watt. The stated application is “Extreme range Wi-Fi HaLow communication”.

LoraMax is a small unit that does LoRa on 902-928 MHz and also Bluetooth (on 2.4 GHz). It has an external antenna connector (presumably for 902-928 MHz) and the transmit power (presumably for 902-928 MHz) is 1 watt. The stated application is “Extreme range LoRa and Meshtastic communication”.

Both units are offered in modules that can be soldered down to a printed circuit board, or as an M.2 card. The latter is significant as the new [Raspberry Pi 5](#) includes a PCIe 2.0 interface, and there are now a number of [RPi 5 PCIe 2.0 to M.2 card adapters](#) available. Thus, theoretically, a HaloMax or LoraMax could be “plug and play” with a Raspberry Pi 5, perhaps even remotable on a tower or other remote location when using a [Power Over Ethernet \(POE\) adapter](#).

To demonstrate the long range capabilities of the HaloMax unit, Teledatics conducted a range test on two mountaintops - Mount Greylock and Mount Wachusett in Massachusetts, and wrote a [white paper](#) about the results.

Teledatics Smashes Wi-Fi HaLow Distance Record

Groundbreaking Achievement Showcases the Future of Long-Range Wireless Communication

Summary

Teledatics, in collaboration with Newracom and TE Connectivity, has set a new benchmark in wireless communication by achieving a 106-kilometer (66 mile) Wi-Fi HaLow connection. This groundbreaking test demonstrates the potential of Wi-Fi HaLow technology for long-range, low-power applications, paving the way for innovative wireless solutions and industrial applications.

...

Performance Metrics

The test achieved impressive performance metrics.

- Signal strengths: -81 to -92 dB
- Connection bandwidth: 1, 2, and 4 MHz
- Frequency range: 902 to 928 MHz
- Distance: 106 kilometers (66 miles)

...

tx bitrate: 6.0 MBit/s

rx bitrate: 6.0 MBit/s

While the range figure is impressive in the context of license-exempt systems, and the “bitrate” seems reasonable for 902-928 MHz, the white paper does not mention any performance (speed) testing being conducted, nor what speeds are possible with what “Connection Bandwidth”. For context, some amazing potential speeds are stated in the [Wikipedia article about 802.11ah](#) such as a conservative example of 20 Mbps when using 64 QAM modulation in a 4 MHz channel.

In correspondence with Teledatics I pointed out that while their range achievement is impressive for license-exempt systems (and previous range testing for 902-928 MHz systems), such range figures between mountaintops with clear line of sight and ample Fresnel Zone clearance are routine in the context of Amateur Radio VHF / UHF / microwave experimentation, including frequencies up to 10 GHz (and possibly higher).

Whether HaloMax and LoraMax will be useful within Amateur Radio will depend on pricing, their real world performance, and their ability to integrate with other Amateur Radio systems. This should be doable, at least with the M.2 card versions as they are stated to have these communications options:

- USB
- UART
- SPI
- I2C

The primary differentiation between 902-928 MHz and 2.4 GHz / 5-6 GHz is that the former does provide some tree penetration, and the latter requires clear line of sight (no trees). In situations where trees are an issue (such as communicating between two stations in a heavily wooded area) and thus a 902-928 MHz link / network might work, but a 2.4 GHz or 5-6 GHz link / network would not work. Another differentiation is that antennas for 902-928 MHz are generally conventional yagi beam antennas rather than dish antennas that are conventional for 2.4 and 5-GHz.

At a minimum, if the pricing is reasonable and the availability is reasonably soon, Teledatics’ HaloMax and LoraMax products with their 1 watt transmit power on 902-928 MHz might make some interesting alternatives for Amateur Radio and Meshtastic networking.

Admittedly it’s a stretch to imagine this possibility, but if Teledatics could adapt their 902-928 MHz products for the 1240-1300 MHz (23 cm) band, that band is accessible in some form to Amateur Radio Operators worldwide (unlike 902-928 MHz).

Disclaimer - I have experienced mixed results from participating in several crowdfunding campaigns on Crowd Supply. As a result, despite offered discounts, I no longer participate in the pre-production crowdfunding phases of Crowd Supply projects. I only purchase Crowd Supply products after they are in production and are shipping from stock. Your experiences

and risk tolerance may vary.

Leave a comment

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

[The LEO Satellite Industry Needs More Engineers](#)

Post publication update - see **Zero Retries 0165** - Followup to *The LEO Satellite Industry Needs More Engineers* for an update relevant to this mini-article. Turns out, *Amateur Radio is a prominent part of this program.*

Kathy Pretz in IEEE Spectrum Online - 2024-01-07:

IEEE is holding educational workshops about the field

...

The LEO satellite market is likely to grow from more than US \$4 billion in 2022 to nearly \$7 billion in 2031, according to Business Research Insights.

Although the market is growing, the number of engineers and technologists who understand the complicated systems is not. That's why in 2021 IEEE launched the Low-Earth-Orbit Satellites and Systems (LEO SatS) project under the leadership of Witold Kinsner. The IEEE Fellow is a professor of electrical and computer engineering at the University of Manitoba, Canada, and past vice president of IEEE Educational Activities.

My thanks to Zero Retries Pseudostaffer Dan Romanchik KB6NU for pointing out this article in *his* article [Wanna work with satellites? Get an amateur radio license.](#)

The article then focuses on the efforts of the IEEE Low-Earth-Orbit Satellites and Systems (LEO SatS) project. The article points out that it has held a number of workshops and other events to educate engineers and students about opportunities in the industry, but it makes no mention of amateur radio. I think that's a mistake, and I've just emailed the leader of the program, Witold Kinsner, reminding him of the role that amateur radio could play.

KB6NU explains the situation very well, and he's *on it*.

Some Promising Movement From ARRL Towards "The Next Generation" and STEM

Zero Retries Pseudostaffer Dan Romanchik KB6NU - [ARRL Member Bulletin on second board meeting of 2024](#):

Yesterday, the ARRL published a report on the second board meeting of the year. There's a lot to like here.

I like the new mission statement. "ARRL's mission is to promote and protect the art, science, and enjoyment of amateur radio, and to develop the next generation of radio amateurs" is short and to the point, and I like the emphasis on developing the next generation of radio amateurs.

KB6NU reprints the entire article from the ARRL, so please read that for full context.

It's encouraging that ARRL is at least acknowledging that there *is a next generation*! In my opinion, way too much of what the ARRL does seems driven by the [Amateur Radio Re-enactment League](#) mentality such as an entire section of QST devoted to reprinting excerpts of QST from decades ago (free content, *plus* nostalgia). I like the additional emphasis of promoting Amateur Radio as part of Science, Technology, Engineering and Math (STEM) curriculums. Sadly, despite the discussion about the increasingly shaky financial foundation of ARRL, they still don't seem to recognize that the "put their content behind a paywall" strategy is a mostly-failed business model (at least for "hobby" content) and that ARRL's primary "enemy" isn't content piracy... it's *irrelevance*. In this era of publicly available content, ARRL's content is, essentially non-existent unless you're a paid-up ARRL member.⁸ Also, sadly I concur with KB6NU's dismay about no recognition by the

ARRL in new (current) technology radically changing Amateur Radio such as Software Defined Transceivers:

Aside from the mission statement, there's nothing in the report that points to the ARRL taking a leadership position in technology development. This is a technical hobby, and the hobby's "national organization" should take a leadership role in the technology⁹.

Connect Systems CS7000 M17 Is Now Shipping From Stock

Connect Systems Newsletter 2024-07-23:

CS7000 M17 has shipped

All orders of the CS7000 M17 has shipped. Additional radios are now available for immediate shipping.

Application Notes for CS7000 M17

We have very detailed application notes for the following:

1. Updating firmware in M17 mode
2. Converting between M17 and DMR
3. Converting between DMR and M17

If you have the radio you must read it. If you are thinking about getting the radio or curious you can also read it. The link to the page the application note is on is below. The application notes are at the bottom of the page.

[Application Notes](#)

And there will be at least one major firmware update soon, per the Connect Systems Newsletter 2024-07-24:

Status of New Firmware

Currently I'm doing a pass of refactoring/ reworking/ consolidation of all the work done so far. Immediately after this, I'll implement the persistence of settings and VFO, which is fundamental, and send you another firmware image. I cannot make an exact estimate, but I hope to have something ready by the end of the next week.

Congrats and Kudos to Connect Systems (Jerry Wanger KK6LFS) for stepping up to the challenge (and considerable expense) to create and ship the very first *commercial* M17-native radio units that provide M17 capability out of the box.

Even after years of development, it's early days for actually getting *M17-native radios* into folk's hands for real-world usage (as opposed to adapters such as Module 17 or M17-over-Internet usage). **M17 is a big deal** because M17 is the digital voice system for VHF / UHF Amateur Radio that is open source (no dependency on a proprietary CODEC) and is designed for Amateur Radio.

The CS7000 M17 is so new it's not yet listed on [Connect Systems' main Amateur Radio page](#), and the [purchase page for the CS7000 M17](#) states that it's still in the pre-order stage (for the \$449 discount price) and availability is "Late September 2024". But note that second line above - "Additional radios are now available for immediate shipping".

At least two folks on the [m17-users email list](#) report that they've received their CS7000 M17 radios.

As for being able to use M17 with a repeater, the primary method of creating an M17-capable repeater is to embed a Multi Mode Digital Voice Modem (MMDVM) into an FM repeater, which then enables a number of Digital Voice modes, including M17 (included since 2020). Thus I recommend some reading:

- **Zero Retries 0107** - Building an M17 Repeater
- **Zero Retries 0124** - Multi-Mode Digital Voice Modem (MMDVM) Update - October 2023
- **Zero Retries 0130** - Reimagining Amateur Radio Repeaters in the MMDVM Era
- [How to make a MMDVM Digital Repeater](#)

- [W6CX-DV -- MultiMode Digital Voice Repeater](#)

It's unfortunately not reflected in the "declared" Digital Voice modes this repeater supports, but it has been reported to support M17 (and it was tested). Note this subtle mention on the page: *We are one of the first repeaters to now support the patent free M17 digital voice mode.*

[BridgeCom Systems BCM-220 Mobile \(Data\) Radio on Sale for \\$250](#)

The BridgeCom Systems BCM-220 222-225 MHz mobile / base radio is normally \$350, but currently there is a "code" (BCM100OFF) shown on the sales page for \$100 off at checkout. The BCM-220 has two Zero Retries Interesting features:

- It can operate in the [219-220 MHz "data band"](#) - the only Amateur Radio unit that I know of that can do so without modification.
 - It has a flat audio connector on the rear enabling it to be used for high speed data such as VARA FM. The connector is a unique high density 15-pin DSUB connector (same as a computer VGA connector). Fortunately, Masters Communications offers the [BCM-6 adapter](#) to convert this odd connector to a standard 6-pin MiniDIN "data" connector for Amateur Radio data use.
-

[WSJT-X SuperFox Verification is Flawed](#)

"xssfox" on their blog (discovered via Mastodon):

WSJT-X has published a release candidate which includes a new fox mode called SuperFox which promises a +10dB total system gain compared to the old fox mode. It also comes with a "SuperFox digital signature" in attempt to alleviate dx-pedition pirates. Verification of dx-peditions is an excellent idea, and I really want to see this problem be solved.

...

Security by obscurity is a bad idea

I'm sure you already know this one. Security by hiding the algorithm is a bad idea. You might have noticed that when I walked through how SuperFox is meant to work, that there was no step for where "WSJT-X downloads latest keys" or "user inserts public key". That's because the only security provided by this system is from the algorithm used to "sign" the messages.

The good news is that it's no longer obscure...

```
mwheeler@foxbook superfox_keygen % gcc -I. main.c <censored>.c  
mwheeler@foxbook superfox_keygen % ./a.out NOCALL  
OP0C-COPY
```

I spent a little bit of time looking at how the binaries worked and made my own implementation of the key generator.

A public release of this code as GPL will be available after the Jarvis Island 2024 dx-pedition.

Oops. Great example that it's not just a good idea to encourage young, energetic hackers to get involved in Amateur Radio... it's *essential* because of issues like this. Given that xssfox disclaims that they're not a cryptography expert, they seem to have effectively hacked this system in short order. As they discuss, there are better approaches to a situation like this, and there are ample cryptography experts within Amateur Radio if they were to put the call out.

[Fun Read - Geek of the Week - Phil Karn from 1994-01-26](#)

Malamud: You're perhaps best known in the Internet as the author of KA9Q. Why don't you tell us what KA9Q is?

Karn: Okay well, first of all, KA9Q was actually my amateur radio call, my ham radio call sign. I've been a radio amateur since I was in high school. It's uh, been some time now. But that name has gotten applied to a package of software I wrote primarily for amateur packet radio use. It does TCP/IP under DOS machines.

However it has found quite a following beyond amateur radio. And a lot of are people running it who have nothing to do with amateur radio.

Definitely a fun read - recommended! This interview was conducted on [Internet Talk Radio](#) by Carl Malamud. It was a “conventional” talk radio interview program... that was made available on the nascent Internet rather than broadcast radio.

[The Beauty of Keyboard to Keyboard Digi Modes](#)

Michael Clemens DK1MI:

...

I find it absolutely fascinating to be able to make longer intercontinental conversations with just a little power and even in less than ideal conditions. You have a lot more time to think during the conversation as it would be in SSB, which is very helpful if you're not talking/typing in your native language. I used a mixture of macros and manual keystrokes to automate, for example, the beginning of each pass or the transitions to the other station, but also longer blocks of text such as the station description.

But even with macro-based QSOs you learn much more about the person on the other side than in any FT8 or in most SSB QSOs. It was the latter in particular that I realized with regret. SSB remains my main mode, but I have now found a functioning alternative mode that meets my requirements.

I would like others to give the many different keyboard to keyboard modes available a chance. I keep reading about younger radio amateurs who don't dare to try SSB and prefer to communicate via the computer and then use FT8.

The main message of this post: **Modes like Olivia, JS8call and PSK31 offer a great opportunity to communicate non-verbally but still personally. It could be the perfect way to enjoy ham radio as an introvert or as a ham with a sub-optimal antenna situation in a way that it's still a personal communication between humans.**

I'm in complete agreement, and when I get back on HF, data modes will be primary for me, both networking (exchanging automated messages and files) and keyboard to keyboard chatting as DK1MI describes.

[Working the International Space Station from a Commodore 64](#)

Alick Gardiner (2021):

Using the ISS digipeater from a Pakratt PK-232MBX TNC, Yaesu FTM7250 and Commodore 64

After getting my Amateur radio licence I was wondering what to do next and noticed that my Commodore 64 was sitting right next to my Transceiver and remembered when researching my BBS [See previous blog post](#) that there were packet radio BBSs. Packet radio to a BBS probably isn't practical since I'd be the only person in the local area using it, but packet radio (Sending/receiving data packets via radio instead of through the internet) was an interesting idea, and the fact that the International Space station has a repeater for packet radio seemed like a good final objective.

...

Note that this writeup won't assume a lot of prior knowledge. As a lot of this hardware is 30-40 years old it can be tough scraping together relevant bits of information from many disparate sources among the dead links or discovering it yourself so I'm going to go into a lot of detail here for the next person.

This article goes into an impressive amount of detail on how they were able to accomplish this.

[An Initial Review of the RFNM Software Defined Radio](#)

RTL-SDR.com:

Last year the RFNM (RF Not Magic) software-defined radio was announced and opened up for pre-orders.

RFNM is an SDR based on the new 12-bit LA9310 baseband processor chip, and together with either a 'Granita' or 'Lime' daughter board it is capable of tuning from 10 - 7200 MHz or 5 - 3500 MHz respectively. It is also capable of wide bandwidth - up to 153.6 MHz on a host device like a PC. The RFNM is affordable, costing US\$299 for the motherboard, US\$179 for the Lime board, and US\$249 for the Granita board. Currently, the second production batch is available for preorder.

Um, wow... tuning range of 5 - 3500 MHz? Up to 153.6 MHz bandwidth? Double Wow! To handle the "153.6 MHz bandwidth" requires connecting two USB cables - interesting approach! This would be an ideal Software Defined Radio for use on the 60 MHz of the Amateur Radio 1240 - 1300 MHz band. Per the review, apparently the software support for the RFNM is "in the early stages". But, still...

[Arizona Beacon Project - Carrier+Q65+CW](#)

Chuck Claver NJ6D on the RFZero email list:

Here in central and southern Arizona we have benefitted from several beacons run by Tom, N7GP, over many years. These beacons served most of Arizona as well as the greater Southwest US. Unfortunately these beacon have gone QRT following a significant desert monsoon storm, knocking out antennas and supports.

The Arizona VHF Society is embarking on rebuilding these beacons and expanding their technical capabilities while we are at it. We are aiming for beacons on 50, 144, 222, 432, 902 and 1296 to start with and future plans to expand upward into the microwave allocations. We are wanting to implement beacons with carrier, CW and Q65 segments in the transmit cycle. The specific Q65 mode will be band specific. During the carrier portion we also want to control a step attenuator to set calibrated level offsets - e.g 0dB, -10dB, -20dB, -30dB and -40dB - or other offsets allowed by a controllable/programmable attenuator. We may even want to apply offsets to the Q65 signal as well.

Sounds like a fascinating project, and the [RFZero](#) community was welcoming and responsive to NJ6D's inquiries about using RFZero as the primary component in these beacons.

Packet RF Forwarding Network Adds New Station

Glenn Allison N3MEL on the [EastNetPacket](#) and [Packet-Radio-RF-Forwarding](#) email lists:

We have added a new station in Florida, and we are very happy to have KD4WLE as the latest station to join the network. Although, at the current time, there are no RF partners in Sean's NVIS range, we would like to change that as soon as possible.

KD4WLE and N3MEL have linked over AXIP temporally to bridge the gap. This will allow any local station to KD4WLE access to the forwarding network.

If there are any stations from Southern Virginia to Northern Florida that would like to become a network forwarding partner, please let me know either by email or direct pack message.

We are not only looking at the East Coast but across the US as well. I know there are others linked via HF around the country, and we would like to link these others in. We only need one of these linked stations to consider putting up a VARA HF Port on our 40 & 80M frequency. There is no need to [interrupt] your other connections but only consider being a part of our growing network with the sole purpose of having a network that is not reliant on the internet and our aging infrastructure.

Those of you on the West Coast might consider contacting Chris KQ6UP. He may be interested in doing RF forwarding there.

Thank you to all the stations listed below for being part of the Packet RF Forwarding Network.

Current Network Stations & Status

Maine:
W1DTX 40M

Connecticut:

K1AJD 40M

Central New York
KP3FT 40 & 80M w/ARDOP
K1YMI 40 & 80M

Eastern Pennsylvania:
N3MEL 40 & 80M w/ARDOP
KC3SMW 40M Currently Offline

Northern Delaware:
KA3VSP 40 & 80M

Southern New Jersey:
KD2HZG 40M

Northern Virginia:
KN4LQN 40 & 80M w/ARDOP

NEW East Central Florida:
KD4WLE 40M

40M 7.103.2 dial UBS VARA HF & ARDOP BW500 offset 1500 Daytime

80M 3.596 dial UBS VARA HF & ARDOP BW500 offset 1500 Nighttime

It is so cool to watch Amateur Radio *automatic message forwarding on HF* re-emerge as more viable in the 2020s than in the early days of Packet Radio (when 300 bps AFSK AX.25 was used, poorly adapted for HF and no Forward Error Correction - FEC was used).

The use of [Near Vertical Incidence Skywave \(NVIS\)](#) provides reliable *regional* communications via HF, which is a needed complement for networking on VHF / UHF where it's sometimes hard to bridge "gaps" of VHF / UHF coverage. (The long stretches of "not much" in the Western US, and especially the interior of Texas come to mind as ideal for NVIS.)

The use of the more advanced data modes specifically designed for HF of [VARA HF](#) and Amateur Radio Digital Open Protocol (ARDOP) has (in my opinion) changed the paradigm of automatic message forwarding on HF from a marginal technique to "just works".

It's doubly cool that there is discussion about forming a US West Coast Amateur Radio NVIS network like the activity underway on the US East Coast.

[WINTNC Update - 2024-07-21](#)

Jon Welch G7JJF on the WINTNC email list:

Since its creation, WINTNC has been written for and compiled using Borland C++ For Windows Ver 5.02. The Borland compiler was last updated in 1997 and has since been discontinued. When I started to convert WINTNC to be 32 bit compatible in 2023, it was easier to continue using the Borland C++ compiler rather than update the code to use a more modern compiler. The conversion seems to have worked very well but the time has now come to abandon the Borland compiler and switch to something more modern and maintainable. Therefore, I have converted the code to use Visual Studio 2022 as an IDE/Compiler and also converted the old format help file (tnc.hlp) to a more modern compiled HTML help file (wintnc.chm). This change should also make converting the code to be 64 bit compatible much easier when the time comes that Microsoft abandons 32 bit software.

Using a newer compiler is a big change and I have hopefully caught all the bugs introduced by the conversion but please let me know if anything doesn't work properly. The new version is file compatible with your existing WINTNC installation so you won't lose any PMS mail files or users you already have. Having said that, do please backup your current working system first before upgrading to the new version.

A side effect of the upgrade is that some dialog boxes currently won't look as pretty as the previous version as Borland used their own controls for things like OK/Cancel/Help buttons with icons for ticks, crosses and help question marks etc. I haven't created new buttons yet so they are still plain and boring looking. Hopefully, this

will get addressed in a future update.

I have also added a telstar client if you connect to any BPQ nodes that are supporting the telstar server. Alternatively, do a 'C glasstty.com:6502' from a cmd: prompt.

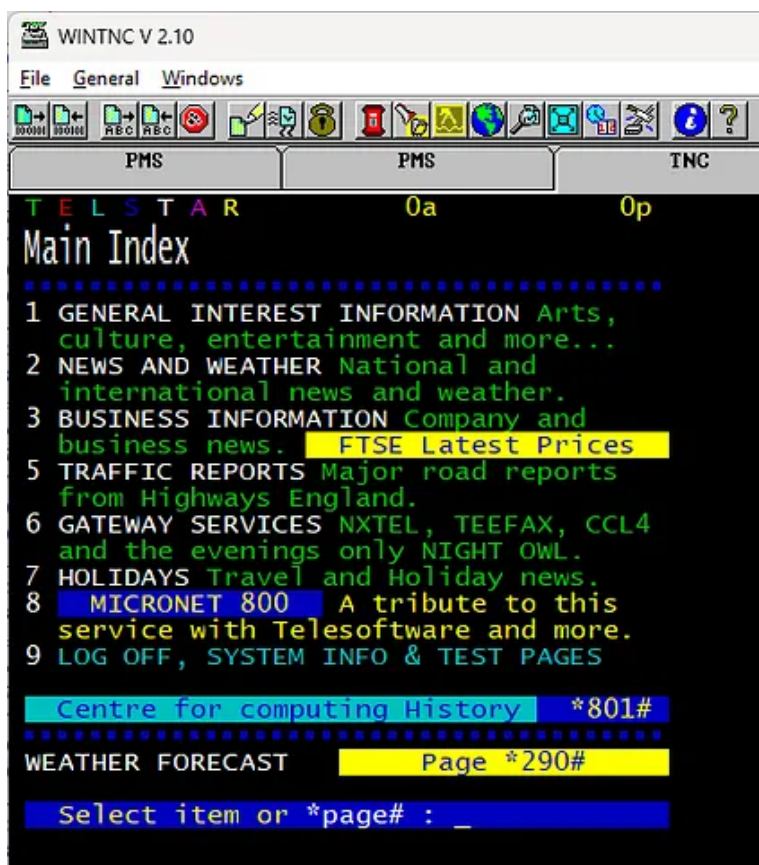


Image courtesy of Jon Welch G7JJF

I haven't added the updated info to the web site yet but you can download the installation file from <https://www.g7jjf.com/progs/wintnc210.exe>. From now on, I won't be doing separate update files and full installation files. They will all be full installation files and will ask whether you want to perform a full install or upgrade over an existing installation keeping existing files intact.

I'm a fan of G7JJF and WINTNC! Initially he revived WINTNC to be able to run on current versions of Windows and removed the payment / registration requirement. Then he *continued* to improve WINTNC in 2024 with additional features and fixes. Now this "big lift" of switching compiler software.

Kudos to G7JJF for "WINTNC 2024"!

WINTNC looks so usable and approachable for working with a KISS TNC. One of my personal experiments in the near future to give WINTNC a try with a few modern KISS TNCs such as the [SMT TARP NinoTNC](#) (a version of the [NinoTNC](#) that uses Surface Mount Technology components, and is sold assembled and tested). We really need user friendly systems like WINTNC to be able to effectively evangelize Amateur Radio, and Amateur Radio data communications, bringing it out of the paradigms of the "DOS" era.

Further reading on "friendly" user interfaces:

- **Zero Retries 0147** - Why It's So Hard to Get People Excited About Using Connected Packet Systems
- **Zero Retries 0147** - We Need Better, More Flexible User Interfaces

Three Zero Retries Interesting Articles by Jason Rausch K4APR

While browsing for something else, I ran across these [three useful Zero Retries Interesting articles](#) by Jason Rausch K4APR.

- [Interfacing Packet TNCs to Motorola Professional Series Mobiles](#)
- [Programming Tait TM8105 Data Radios](#)
- [Adding a MiniDIN 6 Port to a Yaesu FTM-3100 for 1200/9600 Baud Packet](#)

K4APR is the proprietor of [RPC Electronics LLC](#) (mentioned in the Zero Retries Guide to Zero Retries Interesting Small Vendors) and the creator of the [SMT TARP NinoTNC](#) (a version of the [NinoTNC](#) that uses Surface Mount Technology components, and is sold assembled and tested).

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Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out **Join the Fun on Amateur Radio** for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT (Renewed 2024)
 - Founding Member 0002 - Chris Osburn KD7DVD (Renewed 2024)
 - Founding Member 0003 - Don Rotolo N2IRZ (Renewed 2024)
 - Founding Member 0004 - William Arcand W1WRA
 - Founding Member 0005 - Ben Kuhn KU0HN
 - Founding Member 0006 - Todd Willey KQ4FID
 - Founding Member 0007 - Merik Karman VK2MKZ
 - Founding Member 0008 - Prefers to Remain Anonymous 14
 - Founding Member 0009 - Prefers to Remain Anonymous 19
 - Founding Member 0010 - Prefers to Remain Anonymous 39
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:
<https://www.zeroretires.org>
- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset

expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:

Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions “Zero Retries Interesting” topics so regularly on his blog (that I otherwise wouldn’t know about) that I’ve bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions “Zero Retries Interesting” topics so regularly on his blog (that I otherwise wouldn’t know about) that I’ve bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories that often feature “Zero Retires Interesting” topics.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It’s a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- [Hot Iron - The Journal of the Constructor’s Club](#) is a delightful quarterly newsletter.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

These podcasts regularly feature Zero Retries Interesting content:

- [Ham Radio Workbench](#) by George Zafiropoulos KJ6VU (and friends)
- [Foundations of Amateur Radio](#) by Onno Benschop VK6FLAB

Zero Retries is currently using the [Substack email publishing platform](#) to publish Zero Retries. It’s particularly suitable for small newsletters as you can get started for no cost.

If you’re reading this issue on the web and you’d like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join **1800+** other subscribers:

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If you’re a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Social Media:

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Zero Retries (N8GNJ) is also on Bluesky — @n8gnj — just click:

[Zero Retries / N8GNJ on Bluesky](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2024-07-26

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Footnotes for this Issue

[1](#)

The photo in the link is apparently when the tower was very new; it’s *nothing* like that now, covered with many antennas and microwave dishes.

[2](#)

The HamWAN website is not exactly up-to-date, and details like this don’t necessarily reflect the current state of the Puget Sound Data Ring.

[3](#)

Involvement beyond KMRE’s (and every broadcast station’s) involvement in the US Government’s [Emergency Alert System \(EAS\)](#).

[4](#)

One great example of “knowing where to look” is the free (recently retitled) [Amateur Television Journal newsletter](#) by Jim Andrews KH6HTV, published approximately weekly. It’s a wealth of information about modern (digital) Amateur Television systems, including repeaters, the digital technology used, user equipment, appropriate antennas, etc. I’ve not read this kind of detail anywhere else... but you have to know *where* to look in order to find this info.

[5](#)

One example is that there is now [an Open Source Software Defined Radio implementation of LoRa](#). Per the article, more

than one! With that, Amateur Radio can tailor LoRa for more appropriate use in Amateur Radio - LoRa on 222-225 MHz, using higher power, different patterns, etc. The general Amateur Radio media is still trying to catch up with explaining LoRa and Chirp Spread Spectrum.

[6](#)

As recently as a few years ago, Ricochet poletop nodes were still powered on and “chirping away” in the Seattle area on 902-928 MHz. Electric utility companies chose not to remove them unless a power pole required servicing.

[7](#)

My thanks to Ward Silver N0AX for that memorable phrase.

[8](#)

In contrast to ARRL’s paywall model of content, you can read every word, of every issue, of [73 Magazine](#) and [Ham Radio Magazine](#) online, for free, and download them as PDFs, *but not QST*.

[9](#)

ARRL *used to do so*. Just one example is that ARRL was very involved in popularizing Amateur Radio Packet Radio and the AX.25 protocol.